Information Delivery Manuals to Facilitate IT Supported Energy Analysis

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Interreg IV A
ÖRESUND – KATTEGAT – SKAGERRAK

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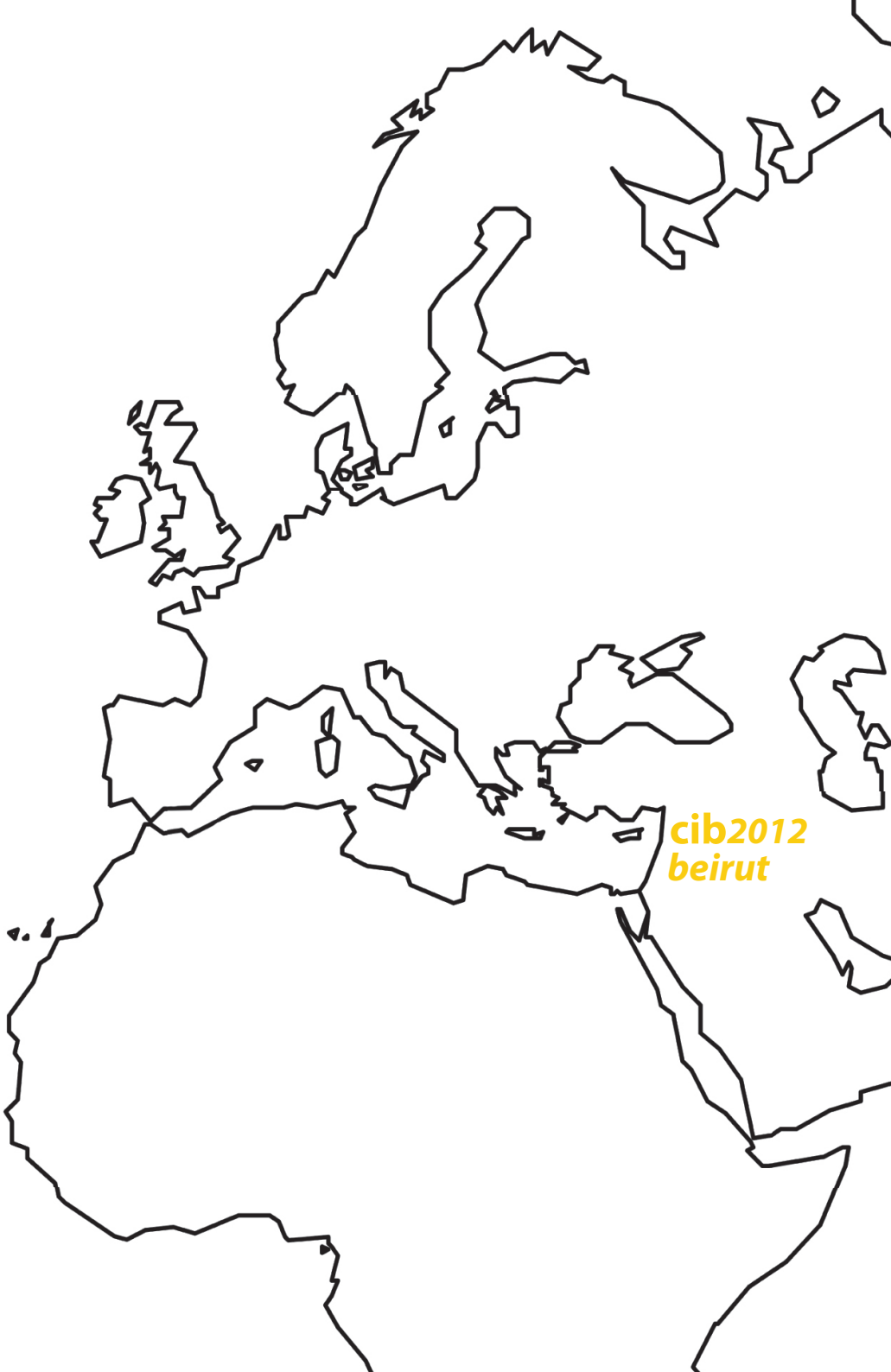
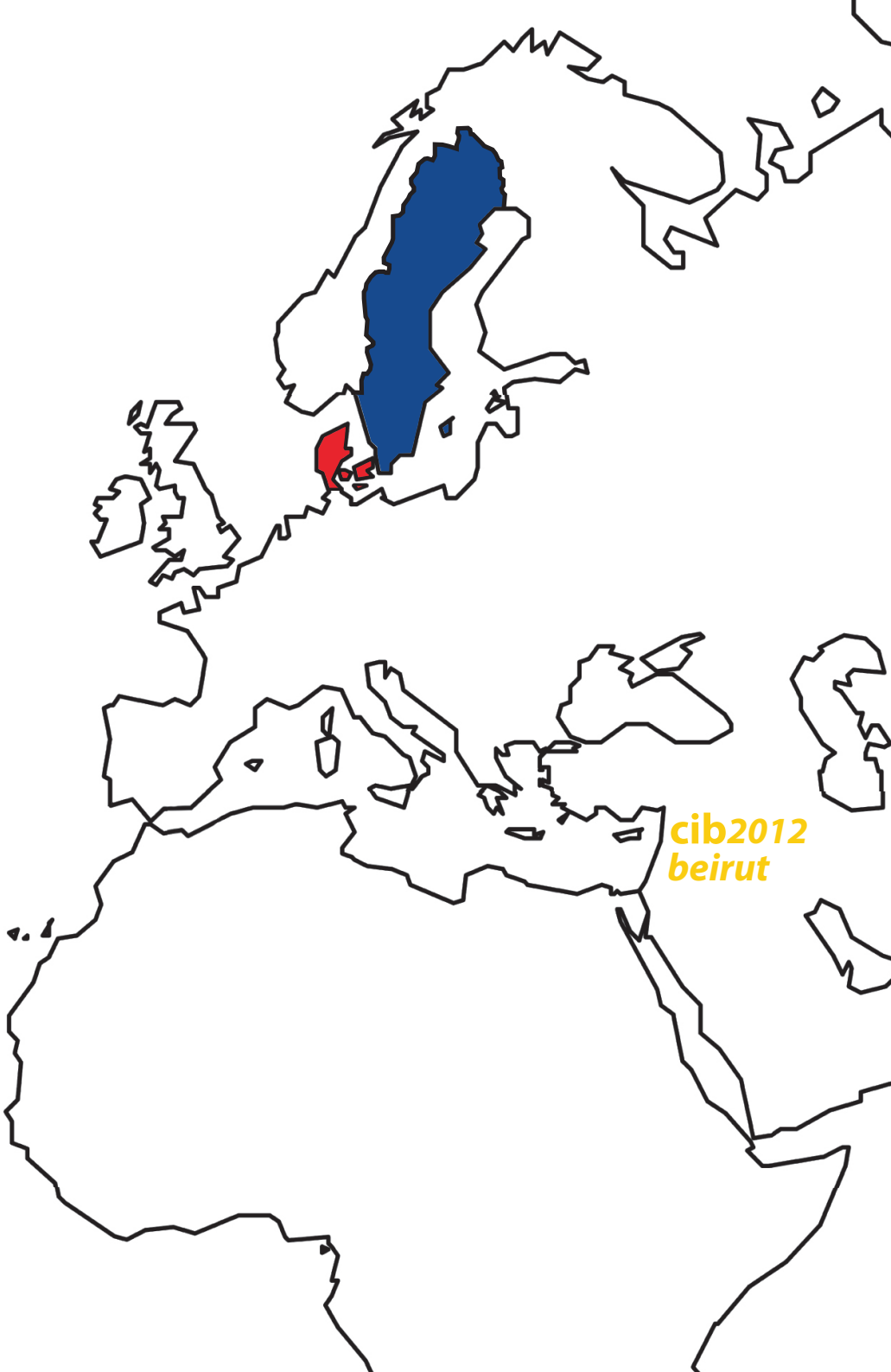


Study Framework

- **Interreg IVA Öresund Programme**
  - Öresund Region (Denmark and Sweden)
  - Collaboration in Öresund AEC Industry
- **Interregional Agenda**
  - Create regional network
  - Harmonize national standards
  - Develop common translators
  - Focus on integration of ICT and BIM
  - Digital communication and collaboration
- **Interregional Partners**
  - Lund University (LTH)
  - Danish Building Research Institute (SBi)
  - Technical University of Denmark (DTU)



Background to Study

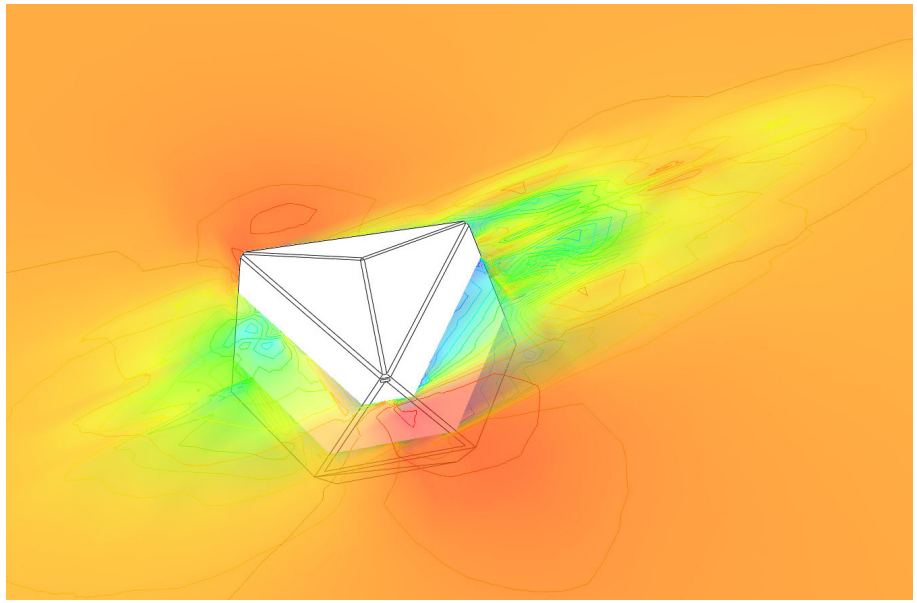
- **Need to Support Energy Efficiency**
  - Buildings are responsible for some 40% of the total energy consumption in the European Union.
  - There is a need to improve energy efficiency and sustainable performance in the built environment.

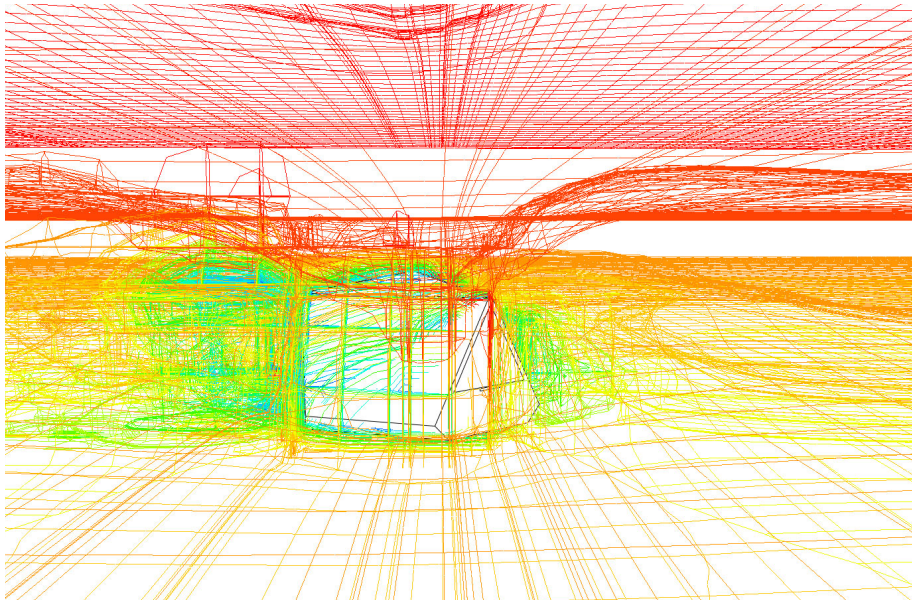
ENERGY EFFICIENCY AND SUSTAINABILITY

Increasing demand for reduction of energy consumption

Background to Study

- **IT Supported Energy Analysis**
  - In this context, IT supported energy analysis have an important role to play.
  - Combining IT supported energy analysis and BIM allows project team members to predict thermal performance and overall energy consumption.





CFD simulations of sustainable lightweight cabins

Objectives and Scope

- **Two Study Goals**
  - The first goal is to explore the processes to energy efficiency in the Öresund AEC industry.
  - The second goal is to develop a common IDM to facilitating IT supported energy analysis at concept design phase.

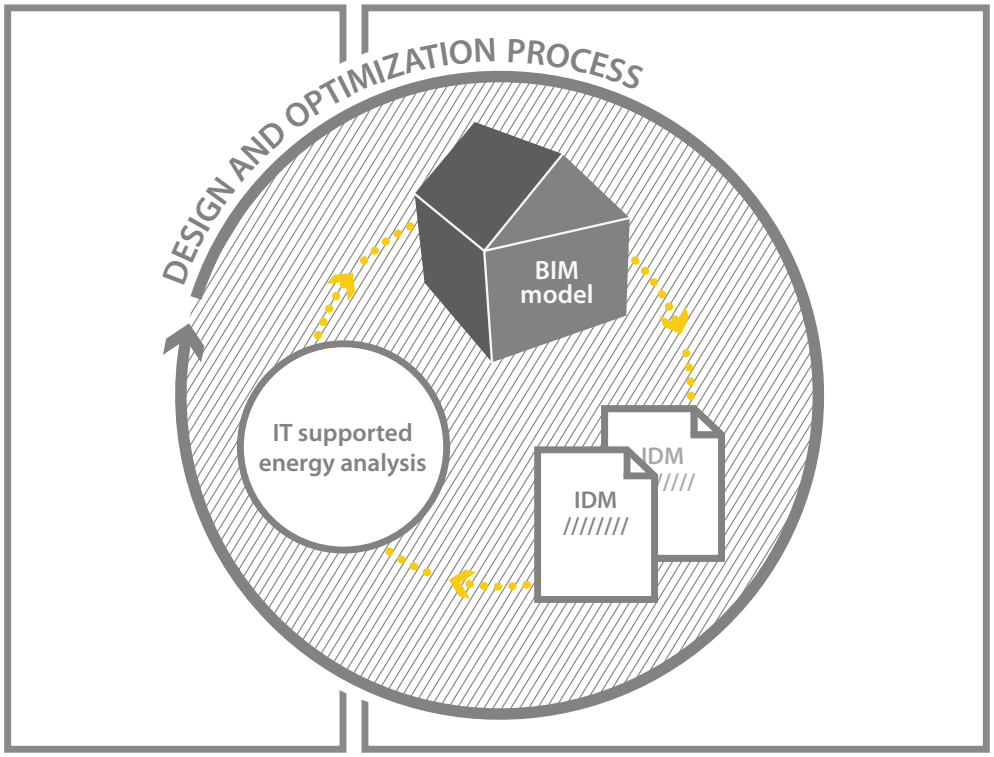
  COMMON INTERREGIONAL IDM

- **Multifaceted Study**
  - This study includes a **review** of current approaches to IT supported energy analysis to understand the background.
  - This study includes a **survey** of Danish and Swedish industry proffesionals to gain an understanding of their knowledge and experience of IT supported energy analysis.
  - This study includes **mapping** of Danish, Swedish, and international simulation tools to get an overview of existing software.

Research and Key Issues

(A) REVIEW

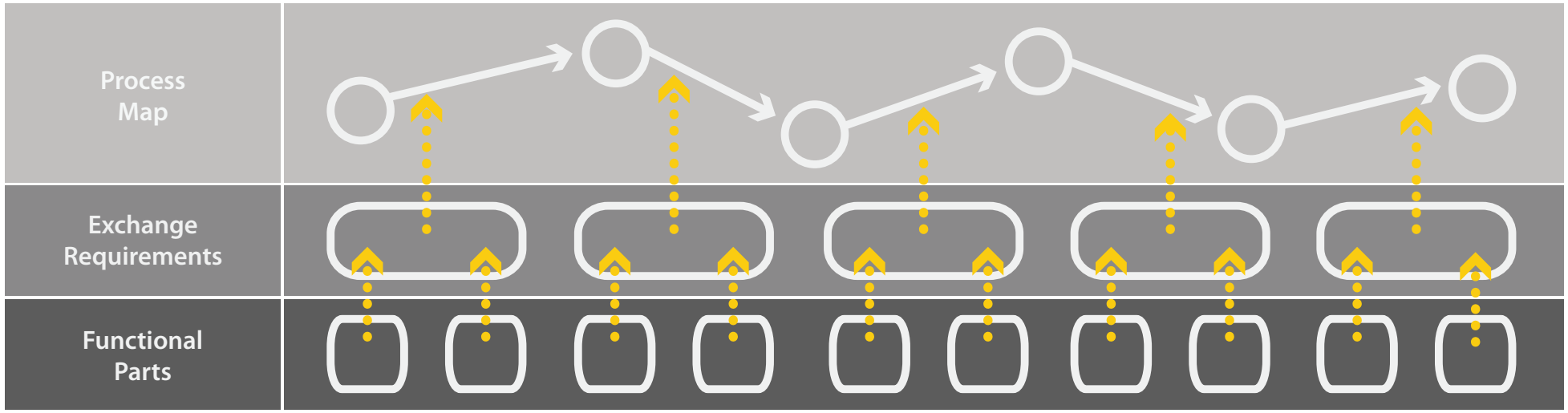
- **Review of Current Approaches**
  - The optimized process of IT supported energy analysis involves BIM-models as source for data and information.
  - Communcation and workpractices are supported by IDMs to achieve common undertanding.



IT supported energy analysis using BIM and IDM

Research and Key Issues

- **Review of Current Approaches**
  - More specific, the IDM defines the information to be exchanged within the IT supported energy analysis.
  - Furthermore, the IDM defines the processes related to the various steps of IT supported energy analysis.

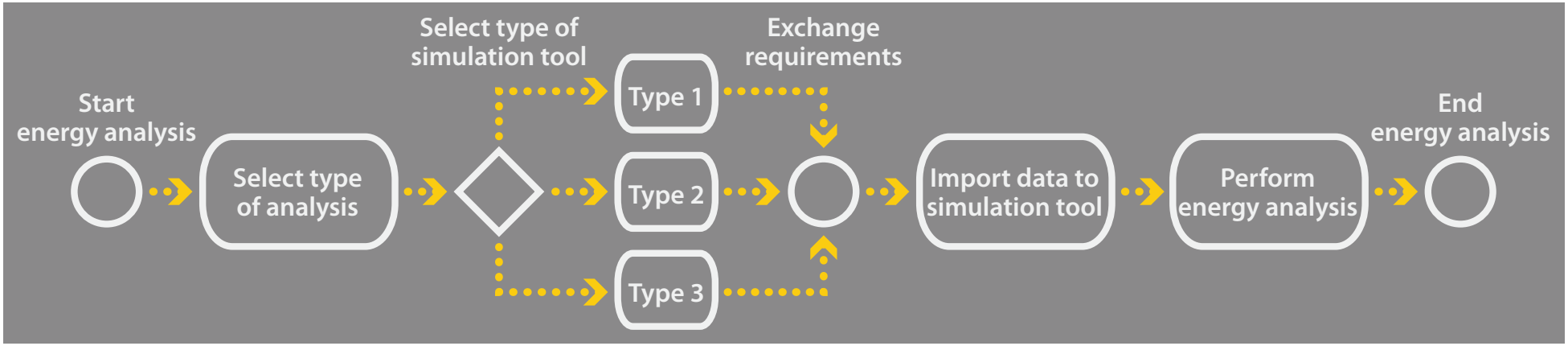


IDM technical architecture

Research and Key Issues

(A) REVIEW

- **Review of Current Approaches**
  - The process for IT supported energy analysis is considered to involve various steps, e.g. selecting type of simulation tool and outlining the exchange requirements.



Conceptual process map for IT supported energy analysis

Research and Key Issues

(B) SURVEY

- **Survey of Industry Proffesionals**
  - All survey participants highlighted the importance of incorporating IT supported energy analysis at concept design phase.
  - Although participants were generally interested in using the BIM-model as data source, digital collaboration leads to a number of technical challenges.
  - Danish and Swedish participants represented different approaches.

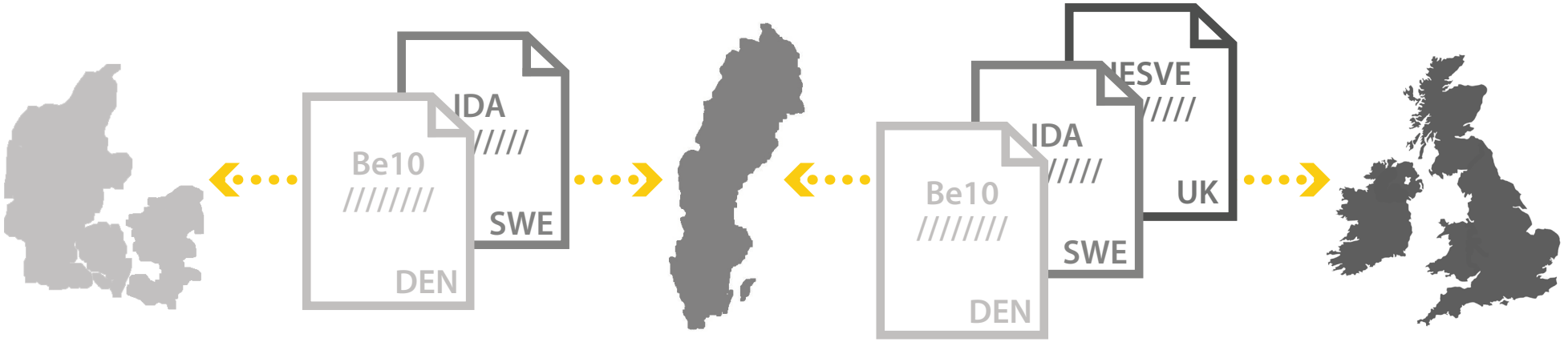
In Denmark, IT supported energy analysis is required to demonstrate compliance *BEFORE* constructing the building.

In Sweden, no such requirements exist. Here, the building's performance is measured and verified *AFTER* constructing the building.

Research and Key Issues

(C) MAPPING

- **Mapping of Energy Simulation Tools**
  - Comparison of Danish simulation tool *Be10*, Swedish *IDA ICE*, and international *IESVE*.
  - The mapping process highlighted similarities and differences, and identified tool-specific exchange requirements.
  - By mapping existing tools, approaches for developing common IDMs were realized.

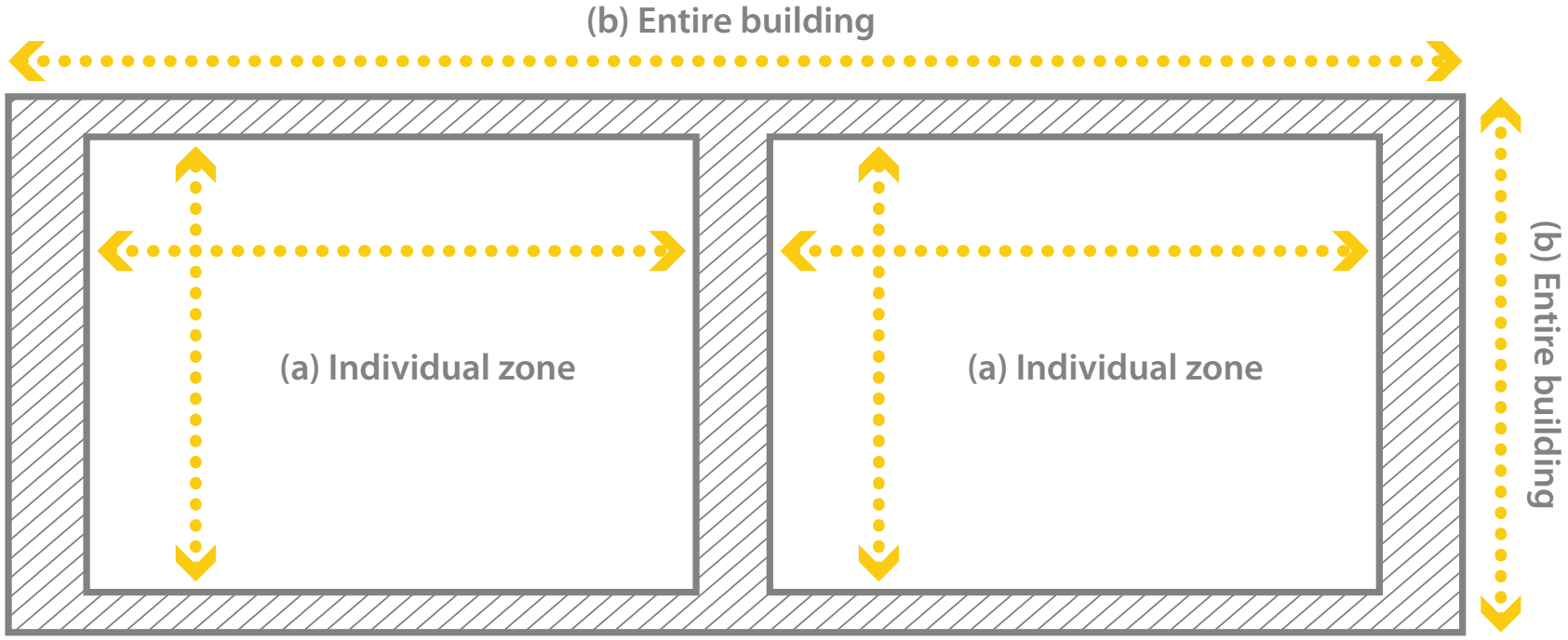


Mapping of Danish, Swedish, and international simulation tools

Research and Key Issues

(C) MAPPING

- **Mapping of Energy Simulation Tools**
  - Be10 calculates energy consumption only, IDA ICE and IESVE allow simulation of both energy consumption and thermal performance.
  - Be10 calculates using a whole building approach, IDA ICE and IESVE enable the simulation of thermal performance of individual zones, as well as energy consumption for the entire building.



Analyzing individual zones or the entire building

Research and Key Issues

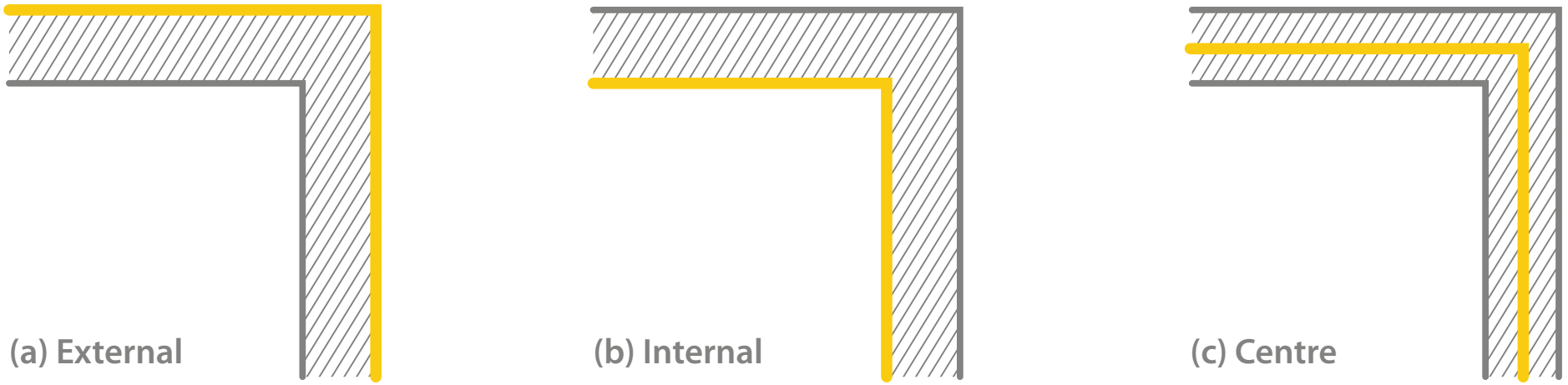
(C) MAPPING

- **Mapping of Energy Simulation Tools**
  - In Be10, the analytical room volume is defined by the external dimensions, in IDA ICE, by the internal dimensions, and in IESVE, by the wall centre line.

DEN
BE10

SWE
IDA ICE

INT
IESVE



Analytical room volume using external, internal, or centre line

Research and Key Issues

(C) MAPPING

- **Mapping of Energy Simulation Tools**
  - The current phase of our study involves mapping of tool specific exchange requirements (Be10, IDA ICE, and IESVE).
  - Mapping defines required simulation data input for IT supported energy analysis.
  - By mapping existing tools, approaches for developing common IDMs are realized.

Type of Information	Information Needed	Required	Optional	Units
Building	The following properties should be included • Identification • Global Coordinates • Orientation	 × × ×		 n/a Deg/Min/Sec Degrees
Building Elements	The following properties should be included • Building Element Type • Construction Type • 3D Geometry	 × ×	 ×	 n/a n/a Varies

Exchange requirement scheme sample

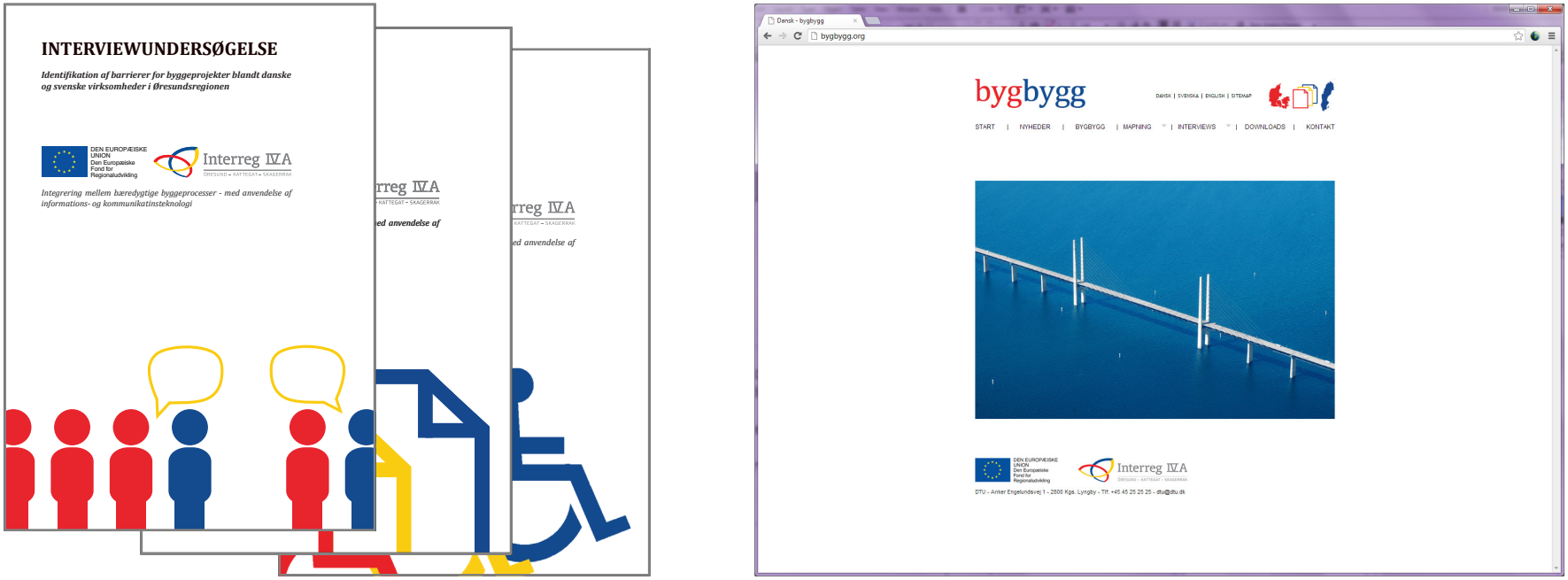
Conclusions

- **Utilizing IT Supported Energy Analysis**
  - Based on the study, layout for the development of a common interregional IDM has been planed.
  - A common IDM to communicate and facilitate energy analysis through the use of BIM and simulation tools.
  - A common IDM to specify the information exchange and overall digital workflows.

INFORMATION DELIVERY MANUALS TO FACILITATE IT SUPPORTED ENERGY ANALYSIS

Contributions

- **Documents and Webpage**
  - Within the study multiple documents have been generated, reporting on interview survey and mapping.
  - The study is presented on the webpage www.bygbygg.org with the purpose of functioning as an online translator of Danish, Swedish, and international approaches.



Multiple documents and webpage

Dansk - bygbygg

bygbygg.org

bygbygg

DANSK | SVENSKA | ENGLISH | SITEMAP

START | NYHEDER | BYGBYGG | MAPNING | INTERVIEWS | DOWNLOADS | KONTAKT

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bygbygg

Vi har bevidst valgt ikke at udvide vores aktiviteter til Danmark.

Tomas Andersson, Ejendomsudvikling i Norden, PEAB

Danske arkitekter besidder ikke tilstrækkelige BIM-kompetencer – dette betyder mere arbejde til Tyréns som BIM-koordinator.

Pål Hansson, Udviklingschef, Tyréns

Samarbejde på tværs af landegrænser kræver et særligt fokus på kommunikation – her kan BIM være en hjælp.

Gunilla Qvarnström, Grundlægger, ProjTools

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Energirammer for nybyggeri

Ved at fastsætte energirammer for nybyggeri begrænses bygningsmassens samlede energibehov. Mapningen sammenligner danske og svenske energirammer.

Anvisninger Danmark

Her følger en mapning af danske anvisninger målrettet emnet *energirammer*.

MAPNING
1. BR 2010 henviser til fastsættelse og specifikation af byggeriets energiramme ved projektstart.
2. Eenergirammer afhænger af bygningstype.

BR 2010 Kapitel 7.2 (Energirammer)

Herunder følger en gennemgang af danske anvisninger målrettet *energirammer*. Der gives eksempler med udgangspunkt i Bygningsreglementet BR 2010 Kapitel 7.2 (Energirammer for nye bygninger).

Anvisninger Sverige

Her følger en mapning af svenske anvisninger målrettet emnet *energirammer*.

MAPNING
1. BBR 2012 henviser til fastsættelse og specifikation af byggeriets energiramme ved projektstart.
2. Energirammer afhænger af bygningstype og klimazone.

BBR 2012 Kapitel 9.2-9.3 (Energihushållning)

Herunder følger en gennemgang af svenske anvisninger målrettet energirammer. Der gives eksempler med udgangspunkt i Bygningsreglementet BBR 2012 Kapitel 9.2-9.3 (Energikrav för nya och befintliga bygninger).

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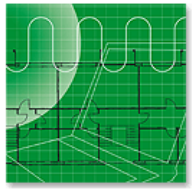
Bæredygtighedsvurdering
Energiberegning
Energibesparelser
Energiforbrug
Grønne regnskaber
Lavenergibyggeri
Livsstil og adfærd
Miljøvurdering
Vedvarende energi

BE10 - beregning



Hvordan dokumenteres det, at lovgivningens energikrav er opfyldt? Og hvordan udregnes energibehov og energiforbrug ved projektering af et nyt byggeri? Det kan anvisningen 'Bygningers energibehov' med beregningsprogrammet Be10 hjælpe med.

Be10 sikrer god energiøkonomi
Beregningsprogrammet Be10 er udviklet af SBi til at dokumentere, at energikravene i Bygningsreglementet og anden lovgivning er fulgt. Men anvisningen kan også hjælpe arkitekter og andre rådgivere med at udregne energibehov og energiforbrug i projekteringsfasen, så der skabes en god energiøkonomi, der kan fremtidssikre byggeriet bedst muligt.

Beregningsvejledningen på anvisninger.dk

Sidst opdateret 09. oktober 2012

Apropos

Vurdering af potentialet for varmebesparelser i eksisterende boliger

Barrierer for realisering af energibesparelser i bygninger

Huse med meget lavt energiforbrug kan blive en god forretning

Videncenter for energibesparelser i bygninger

/ICE 3.0
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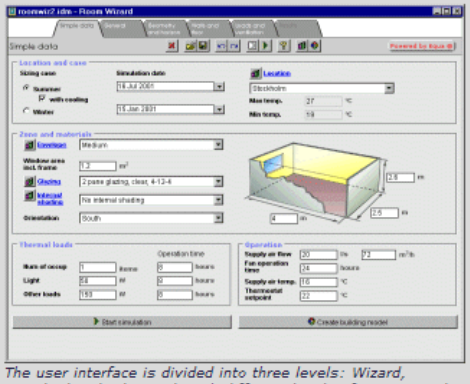
IDA Indoor Climate and Energy 3.0

Introduction

IDA Indoor Climate and Energy (ICE) is a new generation tool for simulation of thermal comfort, indoor air quality and energy consumption in buildings. It has more than 900 registered users, mostly HVAC designers but also educators and researchers. The first version was released in May 1998. Version 3.0, released in November 2001, marks a major development step with several significant improvements.



The user interface is divided into three levels: Wizard, Standard and Advanced, with different levels of support and flexibility. The image shows the IDA Room wizard, for heating and cooling load calculations for single zones. Click on the image for a full resolution version.

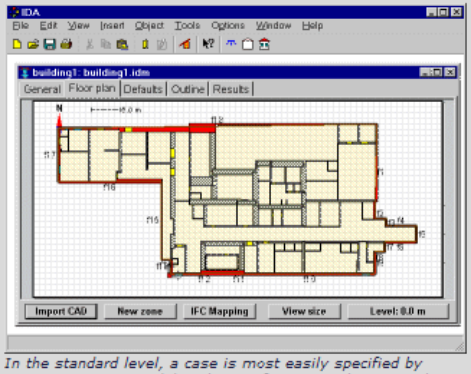
New breed of building performance simulation tools

The mathematical models are described in terms of equations in a formal language, NMF. This makes it easy to replace and upgrade program modules. For the end user, this means that new capabilities will be added more rapidly in response to user requests and that customized models and user interfaces are easily developed. Advanced users can use IDA Simulation Environment in conjunction with IDA ICE to tailor models and user interfaces according to their own needs.

The original development of IDA ICE was requested, specified and partly financed by a group of thirty leading Scandinavian AEC companies. The mathematical models were originally developed at the Royal Institute of Technology in Stockholm (KTH) and at Helsinki University of Technology, now both part of the ICE academic network. All models are available as NMF source code. The models are not tailored to Scandinavian needs but seek to capture the international state-of-the-art in building performance modeling. Whenever appropriate, models recommended by ASHRAE (American Society of Heating, Refrigerating, and Air-conditioning Engineers) have been used.

Usability by non-experts

The user interface has been designed to support an infrequent user as well as the company simulation expert. Wizards provide easy access to key input fields for common simulation tasks such as sizing of cooling equipment. Such a simulation can be carried out from scratch in just a few minutes. Tailored editors are used to describe 3D building and zone geometry. Advanced database features support model reuse. 3D CAD in the standardized IFC format can be directly imported.



In the standard level, a case is most easily specified by importing a CAD model in the IFC format. Each zone in the ICE model is automatically created by selecting a single or multiple IFC spaces. Windows, doors and wall constructions may also be imported, should they be available.

ICE development rests on three corner stones:

- State-of-the-art building performance simulation in a package accessible for practitioners
- Openness and transparency; managing customized versions and many features
- Validation; "trust in the results"; best engineering model for every physical process

next ->

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SOFTWARE

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bygbygg

Dokumentering af energiforbrug

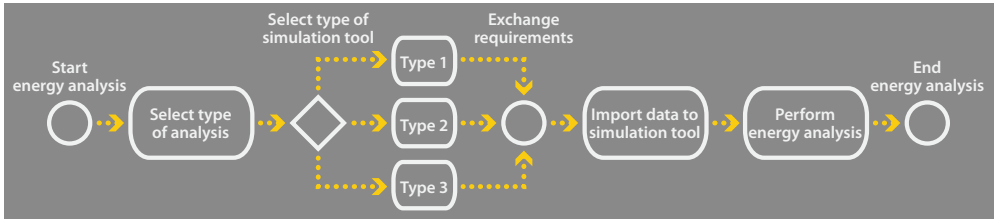
Beregninger af energiforbrug kan bruges til at dokumentere om bygninger overholder energirammen. Mapningen sammenligner danske og svenske dokumentationsmetoder.

Anvisninge Danmark

Her følger en mapning af danske anvisninger målrettet emnet *dokumentering af bygningers energiforbrug.*

Anvisninger Sverige

Her følger en mapning af svenske anvisninger målrettet emnet *dokumentering af bygningers energiforbrug.*



SBi-anvisning 213 (Bygningers energiforbrug)

Herunder følger en gennemgang af danske anvisninger målrettet *dokumentering af bygningers energiforbrug.*

BBR 2012 Kapitel 9.2-9.3 (Energihushållning)
BBR 2012 Kapitel 9.7 (Mätsystem)

Herunder følger en gennemgang af svenske anvisninger målrettet *dokumentering af bygningers energiforbrug.*

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Type of Information	Information Needed	Required	Optional	Units
Building	The following properties should be included • Identification • Global Coordinates • Orientation	× × ×		n/a Deg/Min/Sec Degrees
Building Elements	The following properties should be included • Building Element Type • Construction Type • 3D Geometry	× ×	 ×	n/a n/a Varies

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